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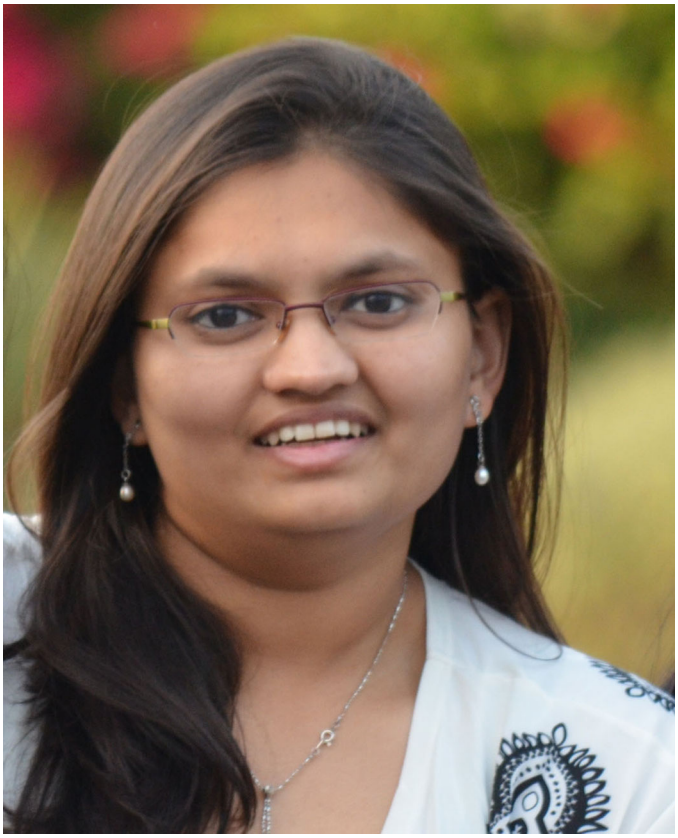
FIRST PERSON

First person – Hiral Shah

First Person is a series of interviews with the first authors of a selection of papers published in Journal of Cell Science, helping early-career researchers promote themselves alongside their papers. Hiral Shah is first author on 'Dual role for fungal-specific outer kinetochore proteins during cell cycle and development in *Magnaporthe oryzae*', published in JCS. Hiral is a PhD student in the lab of Johannes Manjrekar and the late Prof. Bharat Chattoo at Bharat Chattoo Genome Research Centre, Gujarat, India, investigating the role of microtubule-associated proteins in fungal development.



Hiral Shah

How would you explain the main findings of your paper in lay terms?

The rice blast fungus *Magnaporthe oryzae* infects rice and many other cereal crops, destroying a vast number of plants that would be sufficient to feed millions of people around the world. In order to enter plant tissue and multiply within it, the fungus goes through many different stages during its life cycle. An important step that controls fungal development is mitosis, which involves the equal segregation of chromosomes (DNA) between the two newly formed daughter cells. During segregation, chromosomes are pulled to the two opposite poles by microtubules through the multi-protein motor called the kinetochore. A component unique to the fungal kinetochore is the Dam1 protein complex. We studied Dam1 and its associated protein Ask1 during fungal development. We found that apart from mitosis, Dam1 plays an additional role in the extension of fungal hyphae, and without Dam1 the fungus forms a more branched network with irregular cell size. In addition, without Dam1, the DNA is not segregated properly and the fungus does not grow, produce spores or infect leaves as it normally would. Spores are generally spindle-shaped with three cells. In the absence of Dam1, the number of spores is reduced and most spores have only one or two cells. Since Dam1 is so important for the fungus and is not found in rice plants, if we find a way to block it, we could potentially control rice blast disease without adversely affecting the crop.

Were there any specific challenges associated with this project? If so, how did you overcome them?

The biggest challenge was to carry out live-cell imaging of all the different fungal structures with meaningful spatio-temporal resolution to capture mitosis that lasts just about 3 min, while avoiding any phototoxicity. The rice blast fungus in its life cycle forms three-celled conidia, a polarised germ tube, a dome-shaped appressorium (infection structure), bulging invasive hyphae and a branching vegetative hyphal network, each one having different growth trajectories. For instance, while the germ tube and appressoria are substratum, attached conidia are borne on aerial hyphae. The challenges were overcome through the optimization of growth conditions, incubation times, laser intensity and imaging speed and frequency. Great support came from my co-authors, Kanika Rawat and Harsh Asher, who were always up for the challenge and enthusiastic to try new things.

…every time I look into a microscope is special. No matter how many mitosis events I see, each spindle is even more magical than the first.

When doing the research, did you have a particular result or 'eureka' moment that has stuck with you?

I think it was when we realized that Dam1 function at the kinetochore during mitosis was only one of the many roles of the DASH complex in microtubule-associated proteins, and its contribution during other stages of the cell cycle was just as important to fungal development. Apart from this, every time I look into a microscope is special. No matter how many mitosis events I see, each spindle is even more magical than the first and there is always something more to learn.

Why did you choose Journal of Cell Science for your paper?

We wanted to share our work with a broad cell biology audience. For a fungal pathology lab venturing into cell biology, we were looking for a journal that would be the best fit. Having seen previous

Hiral Shah's contact details: Bharat Chattoo Genome Research Centre, Department of Microbiology and Biotechnology Centre, The Maharaja Sayajirao University of Baroda, Vadodara 390002, Gujarat, India.
E-mail: hiralshah1586@gmail.com

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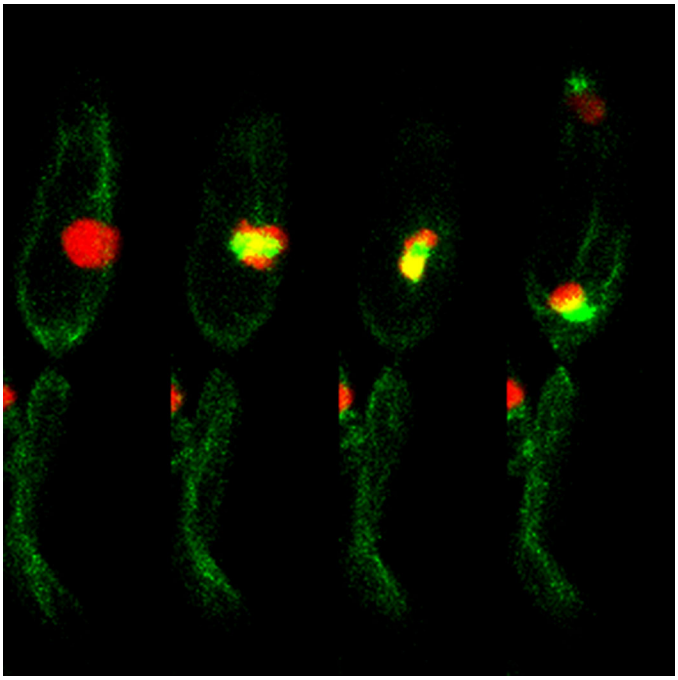

Mitosis in the rice blast fungus during conidium development as it goes from the one-cell to two-cell stage.

papers in the journal on *Aspergillus*, *Ustilago* and *Colletotrichum* cell biology, we felt that JCS was open to moving away from typical cell biology model systems and decided to give it try. Thank you for a smooth peer review process.

Have you had any significant mentors who have helped you beyond supervision in the lab? How was their guidance special?

I was lucky to have two amazing PhD supervisors, Johannes Manjrekar and the late Prof. Bharat Chattoo. I am grateful to Johannes Manjrekar who was always open to scientific discussion and debate. He gave me the freedom to pursue my own interests and nudged me along when I was stuck. Most importantly, he raised the right questions, forcing me to think and think again and sometimes even reconsider my conclusions. He set a great example of work–life balance, often encouraging us to pursue a hobby. Prof. Bharat Chattoo was instrumental in me joining the lab and taking up this project. He encouraged me to set my goals high and do my best to achieve them.

During my PhD, mentorship has come in different ways from multiple sources and I am grateful for all of them. I thank Rajesh Patkar for sharing his experience on working with fungal pathogens, writing manuscripts and in general advising on the challenges and enthusiasm of a scientific career. My colleagues Hashim Reza, Divya Purohit, Akhil Thaker, Khyati Mehta and Anand Parnandi, from whom I've learnt many techniques, presentation skills, lab management, a consistent work culture, and the importance of persistence and clarity, have been great mentors. My parents Anju and Bharat and my sister Kushal have been extremely generous with their time, resources and motivation, constantly standing by my side through my education journey.

What motivated you to pursue a career in science, and what have been the most interesting moments on the path that led you to where you are now?

My career in science and particularly biology started as a love for nature and its infinite diversity. As a child, I would spend hours staring at every emerging leaf, the monsoon snails and every splash of colour from the spring flowers. To a student interested in numbers and geometry, the forms, shapes and patterns of living forms were simply fascinating. In high school, I was introduced to Mendel's peas, the cardiovascular system and the different stages of mitosis, which the teacher had so carefully shown us on an onion peel. It encouraged me to take up biology for my undergraduate studies at Ruia College. It was while performing experiments during my bachelor's and master's courses at the Maharaja Sayajirao University of Baroda that I first found my motivation to pursue science. Reading 'how something works' in textbooks was fun, but performing the experiment and seeing for oneself was way more enlightening and I found an altogether new meaning in my life. It was during these years that I also found my love for microscopy; it allowed me to see nature at a whole new level. My PhD, for which I studied kinetochore proteins, introduced me to the beauty of cell biology and the amazing world of fungi. Along the way, meeting and listening to scientists talk about their work and paths to discovery inspired me to keep going. More importantly, I realized that while I was performing an experiment or looking through the lens of a microscope, nothing else in the world mattered and irrespective of the outcome, I could come back to this again and again every morning.

What's next for you?

I'm looking for a postdoctoral position to answer interesting questions in cell biology. With all the technological advancements in quantitative microscopy, reconstitution studies, chemical biology tools and support from the physical and mathematical sciences, I think we are in a great position to address processes governing the emergence of cell form and function at previously unimaginable space and time scales.

Tell us something interesting about yourself that wouldn't be on your CV

I like gardening, painting and cooking!

Reference

Shah, H., Rawat, K., Ashar, H., Patkar, R. and Manjrekar, J. (2019). Dual role for fungal-specific outer kinetochore proteins during cell cycle and development in *Magnaporthe oryzae*. *J. Cell Sci.* **132**, 224147. doi:10.1242/jcs.224147